

Physics 240	Unquiz 06	Name_____
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A rod of mass M and length L is hinged about one end. The moment of inertia about an end is $\frac{1}{3} ML^2$ while the moment of inertia about the center is $\frac{1}{12} ML^2$.

a: The parallel axis theorem states that the moment of inertia about a parallel axis is equal to the moment of inertia about the center of mass $+M$ (distance to that axis 2). Show that this is valid for the values quoted.

The rod is hinged about the end and is rotating with an angular velocity ω .

b. The kinetic energy of the rod is:

c. The angular momentum is defined by $L=I \omega$. The angular momentum of the rod is given by:

For the case $L=1$ m, $M=1$ kg and $\omega= 1$ rad/s, provide numerical answers to b,c with correct SI units.

$$\frac{1}{12}ML^2 + M\left(\frac{L}{2}\right)^2 = ML^2\left(\frac{1}{12} + \frac{3}{12}\right) = ML^2\left(\frac{4}{12}\right) = \frac{1}{3}ML^2 \quad a$$

$$K = \frac{1}{2}I\omega^2 = \frac{1}{2}\left(\frac{1}{3}\right)ML^2\omega^2 = \frac{1}{6}ML^2\omega^2 \quad b: 1/6 \text{ J}$$

$$L = I\omega = \frac{1}{3}ML^2\omega \quad c: 1/3 \text{ kg m}^2/\text{s}^2$$